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Knowledge Cartography for Open Sensemaking Communities

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Abstract: Knowledge Cartography is the discipline of visually mapping the conceptual structure of ideas, such as the connections between issues, concepts, answers, arguments and evidence. The cognitive process of externalising one's understanding clarifies one's own grasp of the situation, as well as communicating it to others as a network that invites their contributions. This sensemaking activity lies at the heart of the Open Educational Resources movement's objectives. The aim of this paper is to describe the usage patterns of Compendium, a knowledge mapping tool from the OpenLearn OER project, using quantitative data from interaction logs and qualitative data from knowledge maps, forums and blog postings. This work explains nine roles played by maps in OpenLearn, and discusses some of the benefits and adoption obstacles, which motivate our ongoing work.

Keywords: Sensemaking, open content, knowledge mapping

Interactive Demonstration: Examples and downloads for the Compendium software can be found on the OpenLearn site <http://www.open.ac.uk/openlearn>.

1 Introduction

By analogy to the discipline of spatial cartography, "knowledge cartography" (Okada et al, 2008) aims to provide an 'aerial view' of a topic by highlighting key elements and connections. Moreover, just as spatial maps simplify the world and can fuel controversy, maps of conceptual worlds provide vehicles for summarising and negotiating meaning. When we start mapping intellectual landscapes, we are structuring the way that we think and communicate knowledge graphically. Computer-supported knowledge mapping is one way to help people reflect on what they are thinking, and to sharpen the focus of their contributions.

People spatialise the world of ideas all the time, but they currently lack infrastructures for large scale, structured discourse and visualization. The web has evolved from HTML quite dramatically over the last few years with advanced techniques for content and structural modelling enriched with semantic and structural features (Geroimenko and Chen, 2002). Our research is working towards a social-semantic web environment for educators and learners to weave and contest collaboratively network of ideas through knowledge maps. Our thesis is that knowledge mapping thus has a central role to play in weaving narrative connections between OERs. In conjunction with the UK Open University's Open Educational Resources *OpenLearn* project, our investigation focuses on the role of knowledge maps for both learners and educators to share and debate interpretations.

This paper is organised as follows. We start by motivating the need for seeking coherent patterns in an ambiguous information ocean of learning materials and information. In this context, we introduce the idea of open sensemaking communities and two knowledge mapping tools: Compendium (the primary focus of this paper) and a new Web 2.0 tool, Cohere. We analyse some examples of Compendium's OER applications, and consider some of the difficulties we have seen, before concluding with directions for future research.

2 Seeking coherent patterns in an ambiguous information ocean

OpenLearn [www.open.ac.uk/openlearn] is the UK Open University's OER project launched in October 2006, publishing thousands of hours of distance learning materials on the Web for free access

and remixing under a Creative Commons license. Designed originally for students paying for tutor- and peer-supported distance learning, the materials are structured from the start to promote critical reflection on the part of the learner. In an open learning context, however, learners do not have ready access to an expert tutor or cohort of peers, and may be drawing on diverse other OERs, blogs, wikis, newsfeeds and so forth, some of which may be superior, complementary, contradictory, or of dubious authority. So while there is strong *intra*-unit structure embedded in the pedagogical narrative of a given OER, which the learner must critique and internalise, the weaker *inter*-unit structure must be constructed by the learner, or in conjunction with others, as they seek to integrate understanding across OERs and the universe of other information sources. What support for managing this information ocean can we provide in the learning environment in which our OERs are embedded, in order to move learners towards knowledge construction and negotiation? Users need intuitive, powerful tools to manage, share, analyse and track information, ideas, arguments and the connections between them.

Our specific concern within OpenLearn is to investigate support for what we call Open Sensemaking Communities [www.kmi.open.ac.uk/projects/osc: Buckingham Shum, 2005], a concept we are using to investigate *designing for sensemaking*: embedding OERs in an environment that supports end-users (both learners and educators) in engaging more deeply with the material and with each other in self-organising communities of interest. The focus on *[sense][making]* reflects Karl Weick's formative work on *giving shape and form to interpretations*, and the individuals/communities articulating them:

"Sensemaking is about such things as placement of items into frameworks, comprehending, redressing surprise, constructing meaning, interacting in pursuit of mutual understanding, and patterning." (Weick, 1995, p.6)

Weick (1995) points out that sensemaking comprises what people do in socially complex situations, when confronted by incomplete evidence and competing interpretations. The degree of uncertainty around learning will of course vary depending on the learner's ability, the learning objective, the complexity of the material, and to a degree, the discipline (e.g. there are harder 'truths' in the sciences than in the humanities). However, the point is that when there is uncertainty, what else is there to do but through discourse, construct a narrative to fill in the gaps?

The point we want to make here is that sensemaking is about plausibility, coherence and reasonableness. Sensemaking is about accounts that are socially acceptable and credible. [...] It would be nice if these accounts were also accurate. But in an equivocal, postmodern world, infused with the politics of interpretation and conflicting interests and inhabited by people with multiple shifting identities, and obsession with accuracy seems fruitless, and not much practical help, either. (Weick, 1995, p.61)

A primary challenge is to assist self-organising learners and educators in assessing, extending and contesting OERs. This requires access not only to the *text*, but also to the *context* (e.g. annotations, argumentation, and the people behind them). This rationale shapes the selection of the social and conceptual networking software tools that we are evolving, which are designed to make visible and manipulable the connections between ideas, and between the people behind them. What will sensemaking infrastructure enable us to do for intellectual landscapes over OERs?

3 Knowledge Mapping

The learning sciences and collaborative learning technology literatures provide a growing body of evidence on the value of diagrammatic representations of ideas in promoting meaningful learning about a domain. We refer, for instance, to Novak's (1998) formative work on Concept Mapping, Suthers' (2008) work on diagrammatic versus other external representations in scientific inquiry, and the interest in the pedagogical and sensemaking affordances of discourse-oriented mapping techniques that scaffold deliberations in a structured way, under the headings of Argument Maps and Dialogue Maps. The significance of these and other approaches are reflected in several recent collections (Andriessen et al, 2003; Kirschner et al, 2003; Conklin, 2006; Okada, et al, 2008), and forums

dedicated to Concept Mapping and Argument Visualization. While learners can sketch these graphical schemes on paper, software tools open up all the possibilities of repeated editing, linking, embedded multimedia and sharing. We refer to this broad spectrum of approaches to mapping as Knowledge Cartography (Okada et al, 2008), placing particular emphasis on digital representations specifically designed to:

1. *Clarify the intellectual moves and commitments at different levels.* (e.g. Which concepts are seen as more abstract? What relationships are legitimate? What are the key issues? What evidence is being appealed to?)
2. *Incorporate further contributions from others, whether in agreement or not.* The map is not closed, but rather, has affordances designed to make it easy for others to extend and restructure it.
3. *Provoke, mediate, capture and improve constructive discourse.* This is central to sensemaking in unfamiliar or contested domains, in which the primary challenge is to construct plausible narratives about how the world was, is, or might be, often in the absence of complete, unambiguous data.

Building on this conceptual foundation, we have integrated two knowledge mapping tools, Compendium and Cohere, into the OpenLearn platform which is the open source Moodle system [<http://moodle.org>] as summarised in Table 1. The *LabSpace* refers to the experimental zone where new tools were initially released, before migrating into the *LearningSpace* where most users go (by a factor of about 10:1). However, this paper focuses on knowledge maps created in Compendium because Cohere was launched recently.

Table 1: OpenLearn Knowledge Mapping Tools - Compendium and Cohere

Launched	Tool	Feature	Users	Sharing	Map views
Oct 2006 (LabSpace)	Compendium	open source desktop application	single	by uploading maps, which can be downloaded for editing offline	crafted manually by the user
May 2007 (LearningSpace)					
Sept 2007 (LabSpace)	Cohere	social web application	multiple	by making maps public, which can be viewed and edited in the web browser	automatically laid out
Jan 2008 (LearningSpace)					

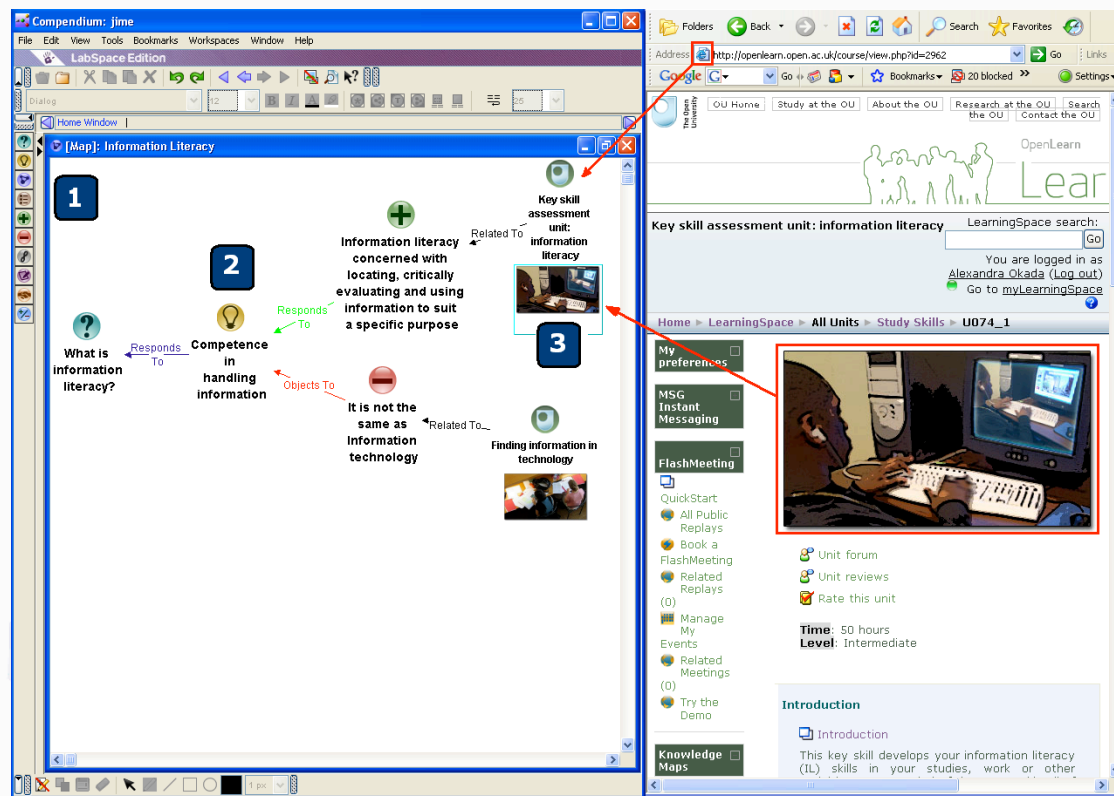
3.1 Compendium

The OU's *Compendium* tool¹ provides a visual user interface for users (e.g. learners, educators or software developers) to cluster, connect and tag icons representing issues, ideas, concepts, arguments, websites or any media document. They can use this to represent their personal reflections as they study or work on a problem, or share their maps with others. Knowledge maps can be useful as a summary of

¹ <http://compendium.open.ac.uk>

a topic, or to share a learning path through the maze of the Web. Text, images, URLs, documents and ideas can be dragged and dropped into a map and connected. The Knowledge Mapping QuickStart Guide² and welcome screencasts³ demonstrate this. In addition to Compendium, we have also released open source the code enabling system administrators to add the Knowledge Map block⁴ to their own Moodle installations, with the facilities to upload and download maps linked to a given course, plus administrator logs.

Figure 1. Compendium's user interface for linking issues, ideas, arguments and documents.



This example illustrates how to create a map in Compendium using dialogue mapping technique:

1. Drag and drop a question-icon from the palette onto the map... and type a key issue, problem, or question.
2. Create new nodes such as for answers, concepts or data; for supporting arguments; for counterarguments. If you want to make connections over the icon with the right button of the mouse, drag then an arrow will appear and drop it onto the other icon.
3. Pictures, sites and documents from the web can be added into this map, dragging and dropping the media resource.

The features of Compendium for OpenLearn are:

- Simplified user interface removing the more advanced features (which can be turned back on if required)

² <http://openlearn.open.ac.uk/course/view.php?name=KM>

³ <http://compendium.open.ac.uk/openlearn/screencasts.html>

⁴ <http://compendium.open.ac.uk/openlearn/moodleblock.html>

- Knowledge Maps Web export integrating HTML interactive Web Maps and Outline views, JPEG images, and XML that can be uploaded to Moodle and automatically linked with a unit.⁵
- Web URLs dragged from OpenLearn or other Hewlett OER projects into Compendium are recognised, and assigned the source site's logo
- Users can categorize each node using a “tag” interface. Through keywords or short phrases they can filter them based on tag combinations.
- Users can browse and exchange maps from Knowledge Mapping Moodle block

4 Analysing the uses of Compendium and knowledge maps in the OpenLearn

Diagnostic reports of Compendium downloads, and map uploads/downloads are generated as part of the Moodle Knowledge Map block in the LabSpace and LearningSpace. The table2 indicates 3413 downloads of the Compendium tool by OpenLearn users from October 2006 to December 2007.

Although the tool was integrated six months earlier in the LabSpace than in the LearningSpace, the number of users who downloaded the tool in the LearningSpace is 22% higher, in part from the different internal OU communities as shown below, but largely from elsewhere.

Table 2 – Compendium software tool downloads

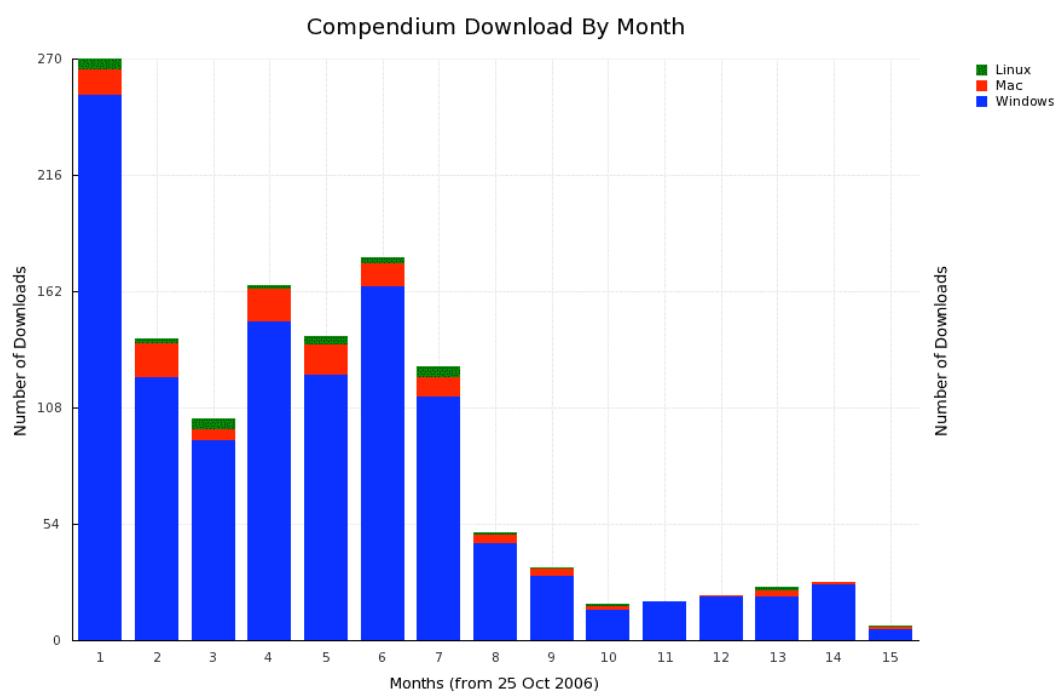
Compendium Downloads	Period (months)	Non OU	open.ac.uk	student. open.ac.uk	tutor. open.ac.uk	Total
LabSpace	15	1009	126	159	19	1323 39%
LearningSpace	9	1877	39	134	15	2090 61%
						3413

Graphs 1 and 2 confirm that the number of Compendium software application downloads has been higher in the LearningSpace than in the LabSpace since May 2007, when the knowledge maps block was integrated in the LearningSpace (note that the Y-axis scales differ slightly between the two graphs).

However, Table 3 shows that the number of knowledge maps uploaded (53) in the LearningSpace has been much lower than in the LabSpace (189). Although 2090 OpenLearners installed Compendium, only 17 users uploaded 53 maps in the LearningSpace.

⁵ Example of the knowledge maps browsing interface in Moodle:
<http://openlearn.open.ac.uk/blocks/compendium/browsemaps.php?context=22&id=2824>

Graph1. Compendium downloads by month in the LabSpace



Graph2. Compendium downloads by month in the LearningSpace

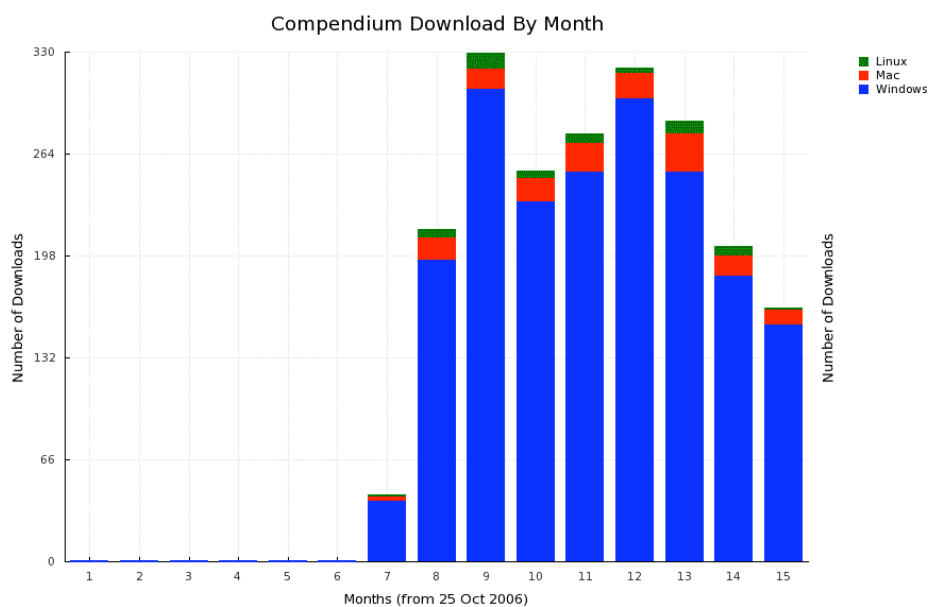


Table 3: Summary of most popular units with Knowledge Maps uploaded and downloaded

Unit	Title	LearningSpace		LabSpace	
		upload	download	upload	download
2824	Knowledge Mapping QuickStart Guide	13	116	12	32
1456	<i>Collaborators – Community of portuguese language countries</i>			45	34
2623	<i>Collaborators - Knowledge Mapping for Learning Design</i>			29	113
2053	<i>Collaborators - Using knowledge media tools</i>			26	5
2487	<i>Collaborators - OpenUniv-Guyana Collaboration</i>			17	6
1526	Global warming	5	10		
1515	French Revolution	4	4		
1608	Strategic view of performance	4	5		
1650	Managing relationships	3	1		
1644	Extending and developing your thinking skills	3	10		
1615	An introduction to business cultures	3	4		
2902	Psychology in the 21st century	3	4		
2502	Reading and note taking - preparation for study	2	1		
2850	EPOCH Psychology history timeline	1	206		
1472	Studying the arts and humanities	1	10		
	
		53	384	189	377
	Total knowledge maps uploaded 242				
	Total knowledge maps downloaded 761				

Table 3 also highlights that the communities of collaborators in the LabSpace who have been using Compendium more frequently for uploading and downloading knowledge maps (e.g. units 1456, 2623, 2053 and 2487). However, in the LearningSpace, there are few OER which present some knowledge maps uploaded. The most popular units for downloading maps are Knowledge Mapping QuickStart Guide (116) and Epoch Psychology history timeline (206).

The application download figures reflect an encouraging level of interest in the tool, although given the established role of concept and mind mapping tools within learning and business, we are not surprised that a free tool offered by the OU which was quite widely blogged — and which already had an active community prior to OpenLearn (currently >35,000 downloads) — should prove popular.

What we are not yet seeing is large scale uploading of maps, with only 242 maps, largely from OU staff, and OpenLearn project members and partner organisations. This relatively low level of public activity (mirrored with other tools) suggests that while technically literate open learners may be relatively quick to test personal tools they can install on their own machines (downloads of Compendium), there is a further threshold to cross before isolated learners who do not know each other

see a need, or feel confident, to share maps. We do not find this surprising. Firstly, we know in principle that it takes time for learners to digest new material, build confidence with new tools, and find peers. Moreover, our recent surveys of OpenLearners indicate that by far the majority are attracted in the first instance by the free OER units, and intend to work on their own. It is clear from the higher levels of usage in the LabSpace that, at least in these early stages, what energises the sharing of maps is the *mediating sociotechnical infrastructure* of a project to which participants are already committed. The participants are either already interested in knowledge mapping, or the project actively encourages the use of knowledge maps.

5 Analysing Compendium knowledge maps applications in the OpenLearn

From the 242 knowledge maps uploaded, we have selected nine examples for closer discussion, which cover all of Compendium's uses to date: organising a conceptual study, generating a brainstorm of existing knowledge, representing a learning path, organising a course module, creating a new OER, structuring a hypermedia OER, developing a learning activity, engaging in learning design, and managing a research project.

5.1 Organising a conceptual study

Figure 2 shows a Concept Map in the LabSpace designed by a student which selected key concepts from the OER unit (U074_1: Key skill assessment unit: information Literacy). This concept map presents eighteen keywords from different pages of this unit, which were connected in order to describe their meaning. Novak (1998: 24) points out "*the more we learn and organise knowledge in a given domain the easier it is acquire and use new knowledge in that domain*". When students structure relevant knowledge from an OER through concept maps, they might recall and apply what they learn easily and quickly. When they know little about that OpenLearn unit and what they know is poorly organised they might face more difficulties to study on their own and it might probably take more time.

Figure 2: Studying the arts and humanities through a Concept Map

The screenshot shows the OpenLearn LabSpace interface. On the left, a table lists Knowledge Maps for 'Mapeando Conhecimento com Aprendizagem Aberta'. The first map, 'Information Literacy Concept Map' by Lila Santos, is highlighted with a red box and an arrow pointing to a concept map. The concept map itself is a hierarchical diagram starting with 'Information Literacy' (1) which 'means' 'Effective use of information' (2). This central node branches into five main areas: 'Appropriate references' (3), 'Knowledge gap' (4), 'Information resources' (4), 'Ethical issues' (5), and 'Evidence' (5). Each area further branches into specific tasks or concepts, such as 'search', 'organise', 'present', 'define', 'analyse', 'reflect on', 'identify', 'develop', 'ensure', 'interpret', 'Results', 'Assessment criteria', 'Different situations', 'Your performance', and 'Improvements'.

Date	Title	View Map	View Outline	Description	Author	Download
09 Jan 2008	Information Literacy Concept Map			Keyconcepts about the effective use of information	Lila Santos	
20 Nov 2007	Media Literacy					
14 Aug 2007	Critical Thinking - Integrated Map					

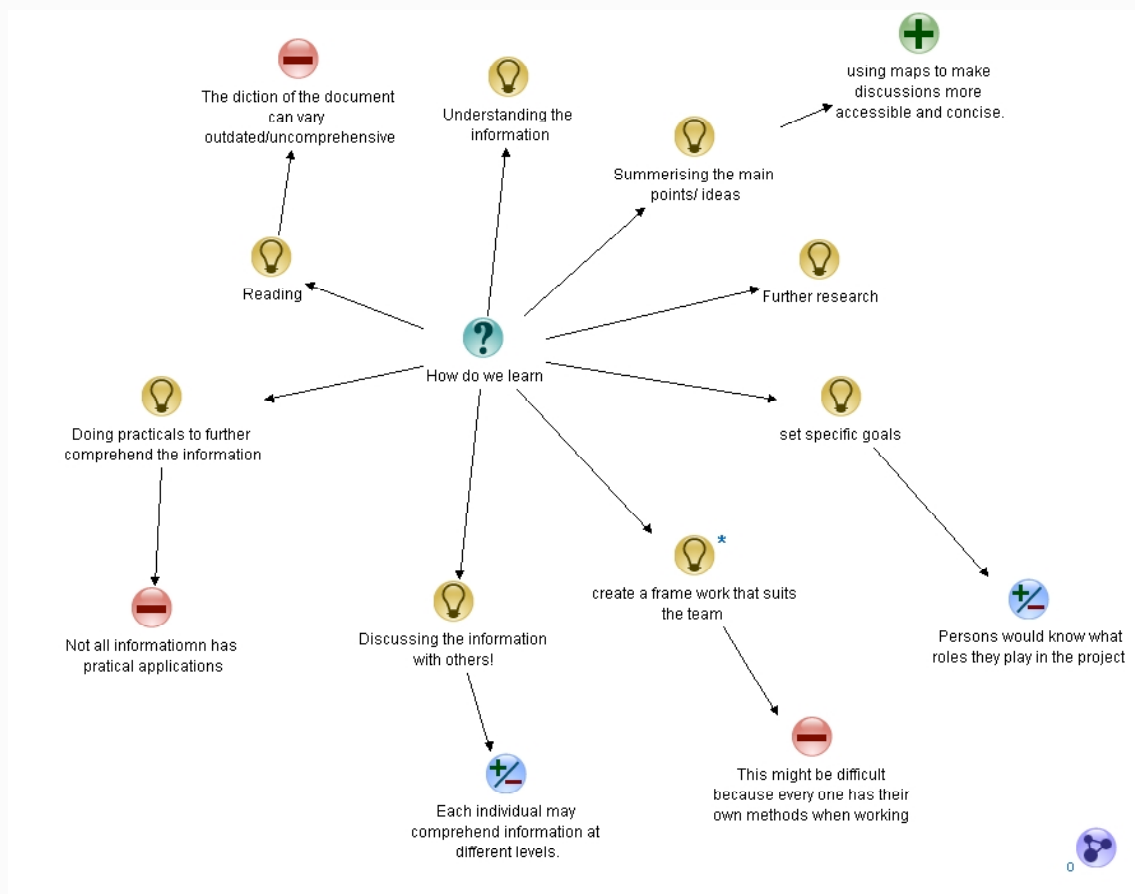
Sharing concept maps can be useful strategy for recording what was studied, continuing later and accessing the content any time. Other OpenLearners interested in the same topic (e.g. media literacy) can also access this map within their web browser, see keyconcepts and get more information by reading their source. For instance, in Figure 2, users can click on the key concept “effective use of information” (number 2 in red) and page 6 will be automatically selected - “Effective use of information literacy skills”.

5.2 Generating a brainstorm of existing knowledge

Figure 3 was created by a participant of a learning community in Guyana, in the LabSpace. Through this mindmap, the participant presented a brainstorm about “How we learn”, bringing different ideas to the OpenLearn unit LDT101_3 - “Learning how to learn”. Although the map has the same title, its content is not related to this unit, what suggested that the participant has not seen LDT101_3.

However, mapping thoughts before studying an OER can be a useful strategy for identifying existing knowledge. Organising a brainstorm through mind maps before learning more about a topic can help students to generate significant ideas and identify their initial interests and hypothesis. Novak (1998, 33) explains that “*working with generative words that have significance and meaning in the life of the learner leads to the learner’s control over the acquisition and use of new knowledge*”. In open education where students must be good self-learners, representing well-organised prior knowledge empowers them to become autonomous in their process of learning.

Figure2. Studying the arts and humanities through a knowledge map
 - [How do we learn](#) - OpenUniv-Guyana Collaboration
 (Natural resource management in wetland systems)



5.3 Representing a Learning path

The map in Figure 3 was developed by an OpenLearn student registered in the unit A207_5 - "French Revolution". On the left, he created a sequence of seven topics which represents the main sections in this unit. He dragged and dropped the OpenLearn website represented by the green icon, which spawned four questions. He added external references such as some Wikipedia pages, which explains some of key concepts in this unit. He also selected some notes from the websites, which were placed in the detail of nine nodes.

Figure 3. A map on the OpenLearn unit on the French revolution, plus related resources

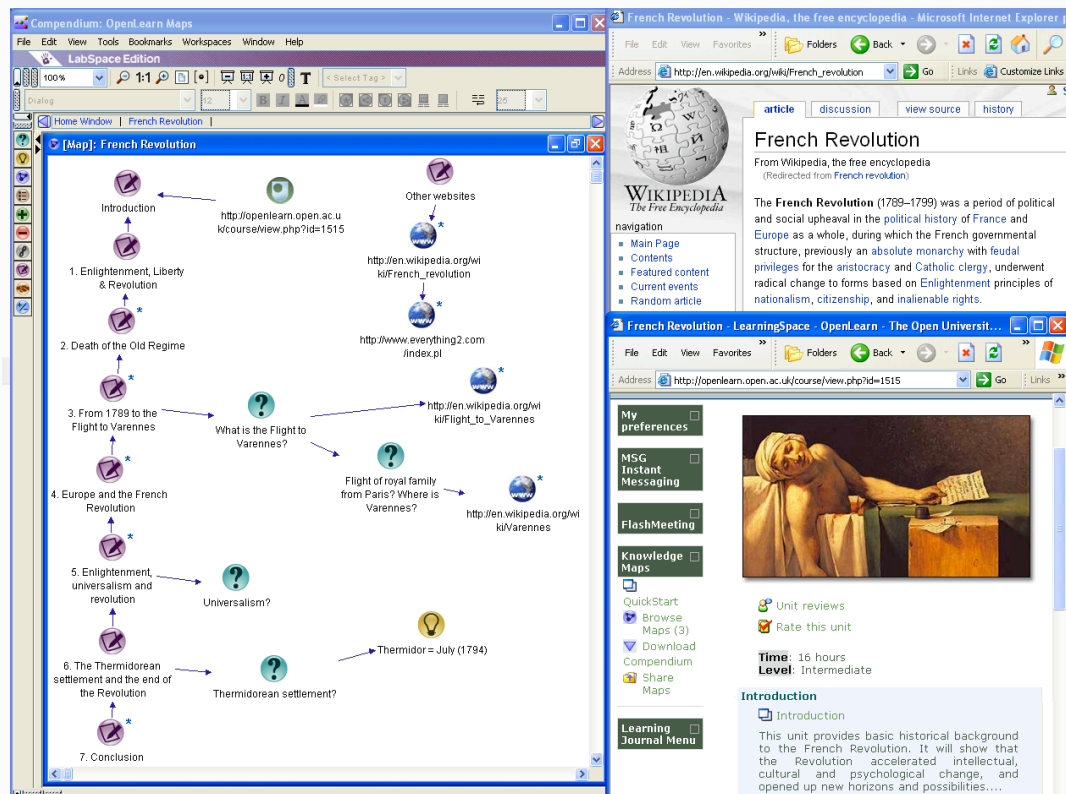


Table 4 shows that this student uploaded three maps in the LearningSpace from September to December. During this period, he wrote three comments in his Learning Journal (Moodle's blogging tool), which suggest three contributions of knowledge maps

1. outlining a course in order to summarise the whole unit;
2. making your own notes to help understand the content;
3. including external references to expand reading.

Table 4: Knowledge Map block and Learning Journal about French Revolution

Map		Learning Journal	
Date	Title	Date	Comments
01 Sep 2007	French revolution	01 Sep 2007	"Began French revolution module and also began using Compendium mind maps to outline course, and uploaded them to website"
01 Sep 2007	French revolution	14 Sep 2007	"Finished reading section 2 of FR module, making notes on Compendium as I go - learning a lot! Rights of Man seems very modern."
11 Dec 2007	French revolution 3rd draft	25 Dec 2007	"Read moderate reformers and expanded compendium notes - the mind map gets more complicated!"

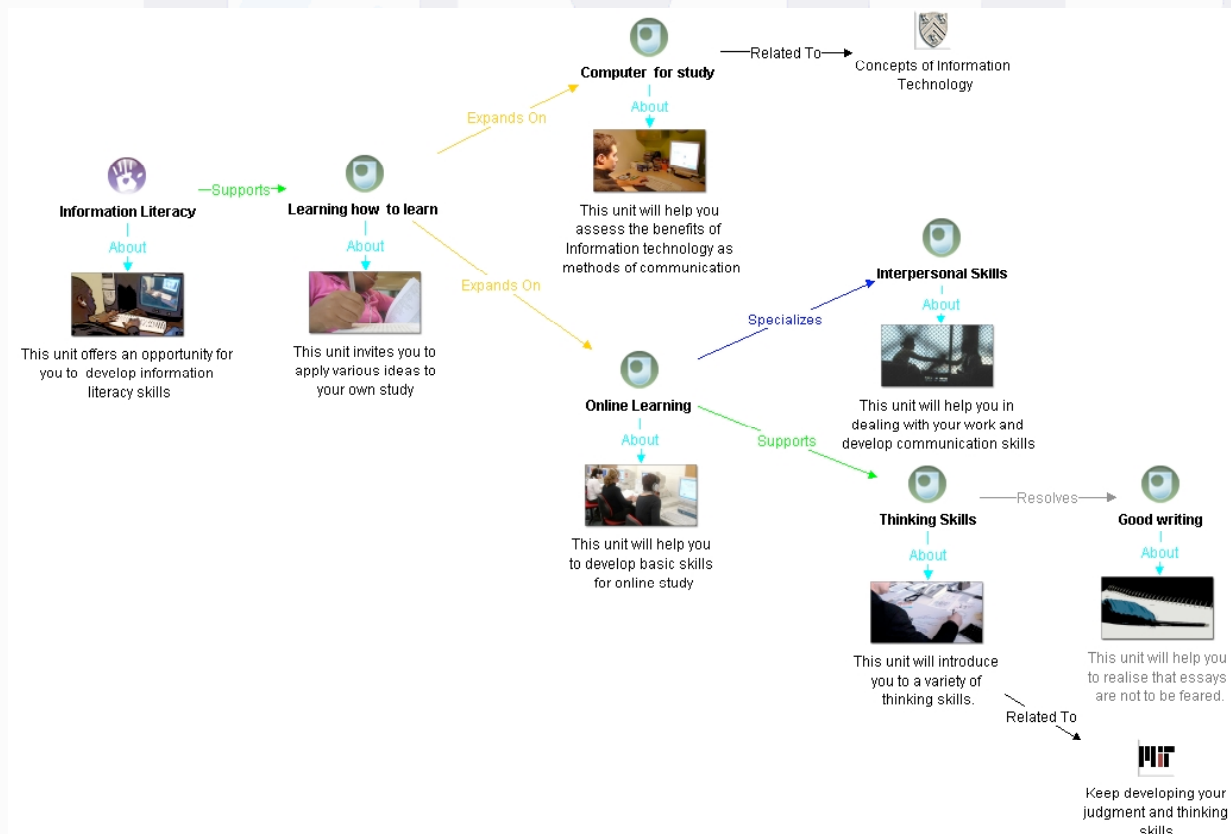
5.4 Planning a Course module

Another kind of representation is a Course Module Map, where educators offer a sequence of OERs significant to a learner to attend their specific needs. This map is also a learning path map which integrates several units. A course module map may offer an interesting group of reference nodes hyperlinked to activities or content from the OpenLearn OERs. It may represent an organised structure showing prerequisite knowledge, learning objectives and estimated study hours.

The map in figure 4 was created by a teacher interested in Information Literacy. It includes seven OpenLearn units and two additional OERs from MIT Open courseware and Connexions. These nine learning materials were organised in five levels (columns). Students can follow this sequence by starting with “Information Literacy” and then “Learning how to Learn”. Depending on their interests they can choose either “Computer for study”, or “Online Learning”. They can then study other units for Developing Skills, such as, “Interpersonal Skills”, “Thinking Skills” and “Good Writing”.

Compendium thus provides a visual authoring tool for the rapid (re)sequencing of learning resources, a form of high level “remixing” of the OU’s OERs. The teaching path map provides non-technical educators with a way to quickly drag and drop websites, documents and media clips into a map, link them and publish them.

Figure4. Teaching path map



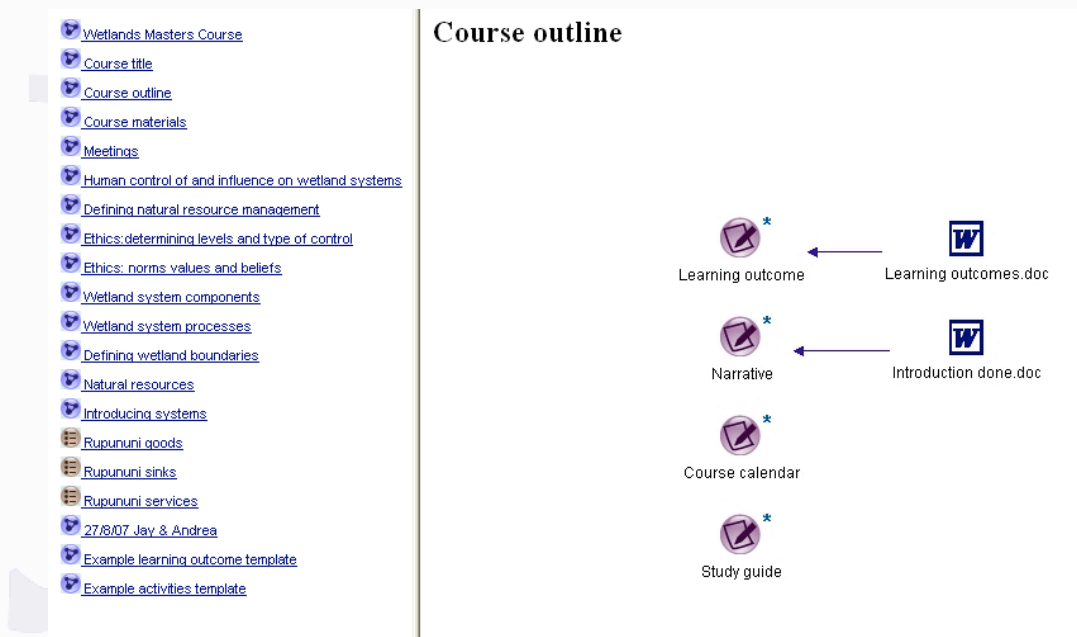
5.5 Creating a new OER

Compendium provides a visual authoring tool for the rapid (re)sequencing of learning resources, a form of high level “remixing” of the OU’s OERs. It means that other teachers with similar interests

can download this map and make changes by deleting or adding new learning materials. The course outline map provides non-technical educators with a way to quickly drag and drop websites, documents and media clips into a map, link them and publish them.

Figure 5 shows a “course outline map” created by an OpenLearn collaborator from the Guyana Community in the LabSpace. Through this map, students can access seventeen maps on the left, which present information about the course and learning materials on the right. They can also open two word documents about learning outcomes and introduction.

Figure 5. Course outline map created in the LabSpace



5.6 Structuring a Hypermedia OER

Compendium has been used to create hypermedia OERs, Web versions of interactive resources providing multiple paths through multimedia information spaces. One of these projects is the EPoCH resource on the history of psychology, illustrated in Figure 6 which presents three maps: 1. a timeline map, 2. a psychologists overview map, and 3. a psychologist's profile map showing their contributions to the field classified by methods, perspectives, topics, contexts and influences.

Figure 6. The EPoCH hypermedia OER and a learning activity map about e-democracy
http://openlearn.open.ac.uk/file.php/2850/knowledge_maps/1183374514/epoch.html



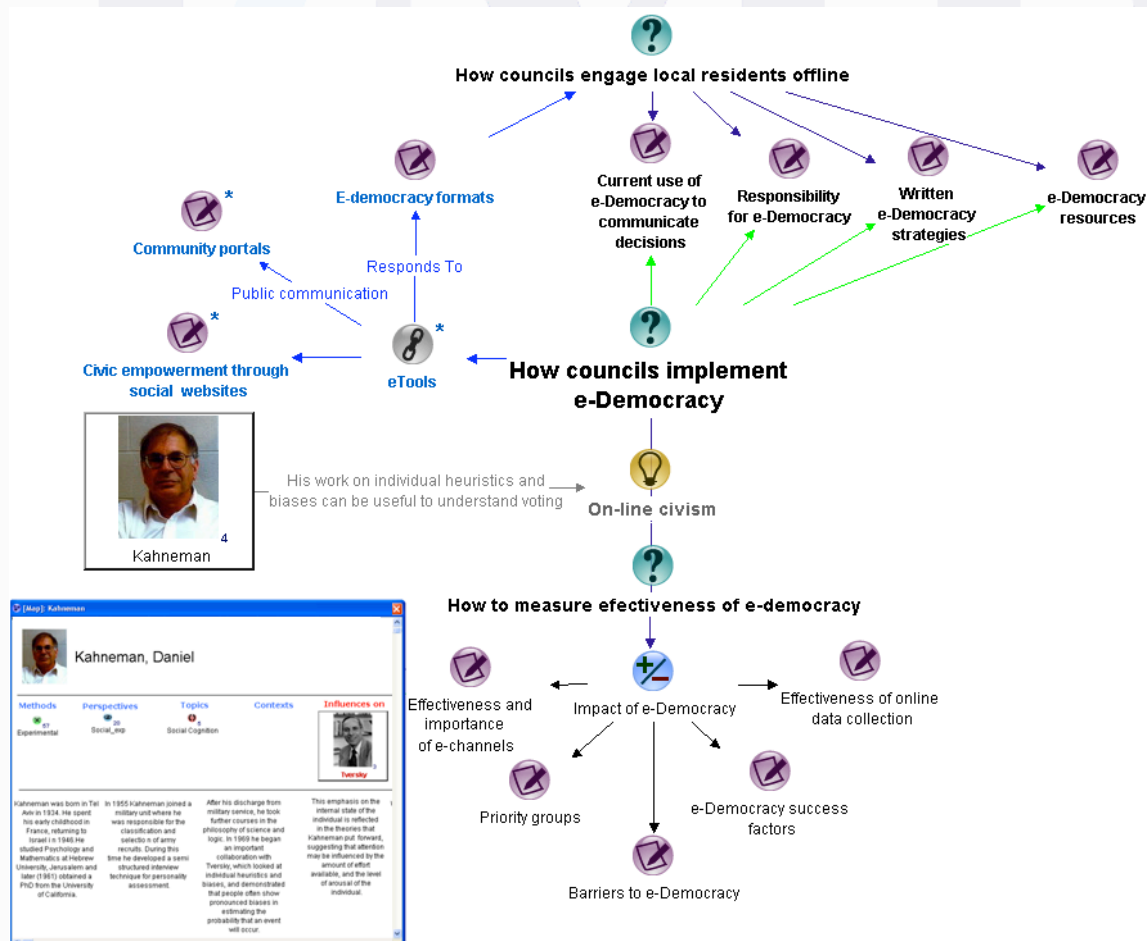
EPoCH - Exploring Psychology's Context and History is a substantial content-based resource developed in Compendium containing extensive psychology based subject information including text,

video, images and audio. It presents biographical details of 100 psychologists as well as descriptions and links between psychology methods, contexts, perspectives and topics. Epoch maps enable OpenLearn users to explore the development of psychological thinking across time and also within different perspectives, methodologies, social and historical context.

5.7 Developing a learning activity

Figure 7 shows a Knowledge Map about e-democracy created by a social science lecturer who used EPoCH to collect some references. He developed this dialogue map (raising issues, posting responses and linking resources) in order to structure ideas for writing an essay related to e-democracy. This map shows three sessions: 1. “How councils engage local residents offline”, 2. How councils implement e-democracy and 3. “How to measure effectiveness of e-democracy”. These sessions might guide writers to organise their paragraphs. This map can be downloaded by other educators and used with their students. Teachers can invite their colleagues to plan and share different kinds of learning activities such as exploring references from this map, comparing different theoretical approaches through concept maps, writing an essay through a mind map of key sentences structured by groups of paragraphs.

Figure 7. E-democracy organising ideas for writing an essay

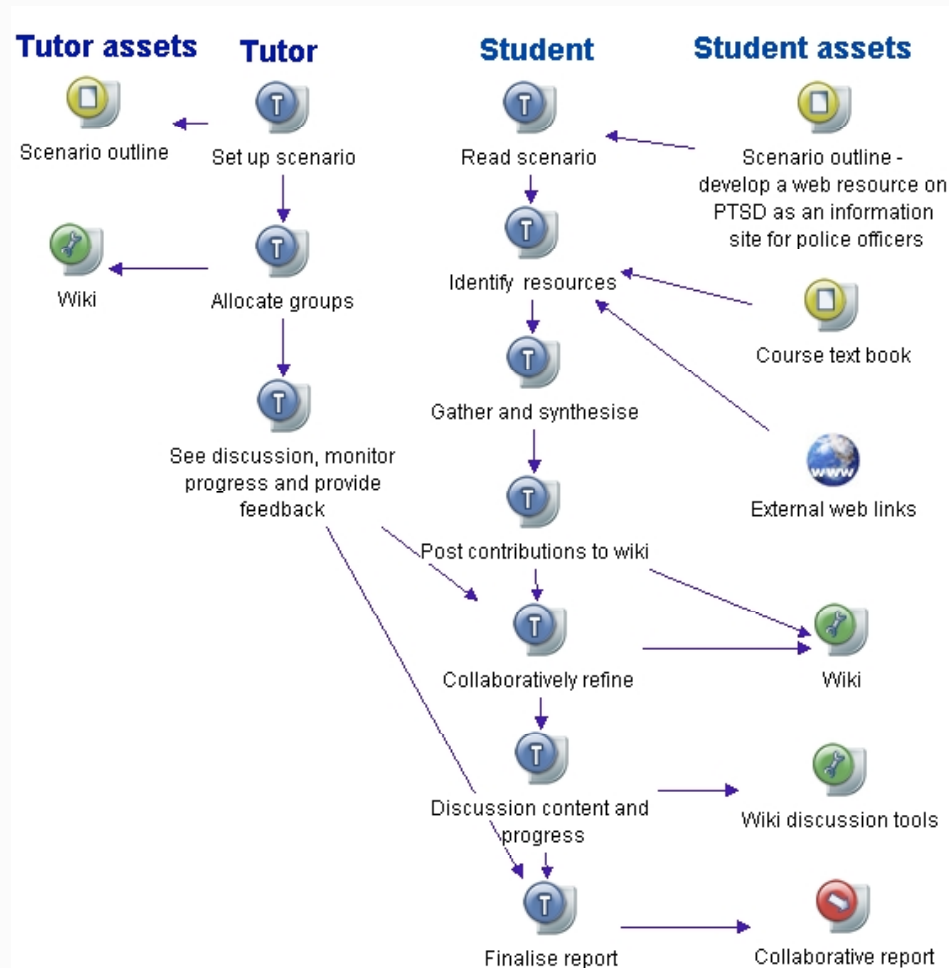


5.8 Implementing Learning Design

Knowledge mapping has also been useful for learning design. In the LabSpace. Compendium has been used by academics at the Open University to design online courses. Conole (2008) reports that in workshops with OU faculty, Compendium provided an intuitive interface to represent different

learning designs by bringing together both narrative accounts of learning designs with notational maps showing the design visually. For instance, the map in figure 8 shows a wiki activity for a course designed using Compendium. This learning design map shows the connections between student and tutor's roles along with their respective tasks which are also associated with assets, tools, resources and outputs.

Figure 8 - Wiki based group project created by Gráinne Conole

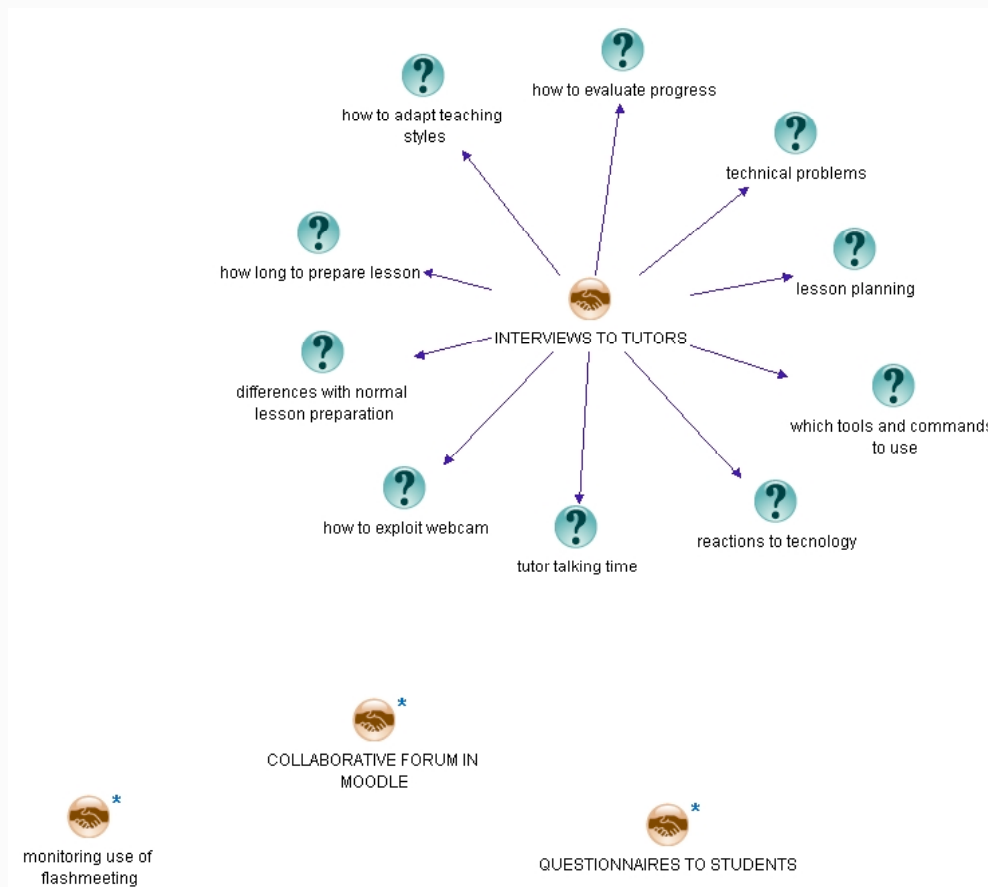


5.9 Managing a Research Project

OpenLearn research team and some communities of collaborators have been using Compendium for planning, implementing and evaluating research projects. Knowledge maps have been useful for structuring and visualising connections between steps or components in different stages of a research. Some examples can be found in two areas in the LabSpace: Collaborators and Research.

The map in Figure 9 was created by an OpenLearn collaborator from the ProTeach Community in Italy. The purpose of this map is to organise a survey as part of a research project. This map shows a brainstorm of ten questions for interviewing tutors. It also includes next steps: planning questionnaires for interviewing students, discussing collaborative forum in Moodle and monitoring the use of FlashMeeting.

Figure 9– Managing the project



6 Analysing knowledge maps contributions and problems

From postings to the discussion forums, we can identify some benefits related to knowledge mapping. OpenLearners record that Compendium was useful for

1. Condensing high volumes of information
"Compendium seems user friendly and useful to condense high volumes of information" - message posted in the LearningSpace on the 11/10/2008.
2. Making your own notes
"Finished reading section 2 of FR module, making notes on Compendium as I go - learning a lot!" - message posted in the LearningSpace on the 14/09/2007.
3. Connecting ideas to familiar references
"After reading sections 1 and 2 and mapping them with Compendium I can note the pleasure of having the ideas connected to familiar references" - message posted in the LearningSpace on the 03/12/2007.
4. Controlling thinking and writing
"Got myself a new computer and am trying to learn how to use Knowledge mapping on it - using KM and Compendium to 'control' all my thinking and writing" - message posted in the LearningSpace on the 28/09/2007.

5. Understanding the content of OER.
"Have just posted two KM on the Critical Thinking site - thought it might be useful/interesting to people to see how I am trying to use KM not at the end of a course but to take notes and to develop understanding of the material". - message posted in the LearningSpace on the 28/09/2007.
6. Gaining insight into a student's thinking
"This map was a treat, very complicated, with all sorts of crossing arrows and symbols all over the place." (a tutor describing a student's map) - message posted in the LabSpace on the 15/06/2007

The most significant comment that we have found that identifies an area of weakness relates to a concept about which we have written elsewhere, namely, "cartographic literacy" (e.g. Buckingham Shum, 2003; Selvin 2008), but which we have not sought yet to address explicitly in our guidance within OpenLearn through a concern to keep the site simple. While a user must first learn how to operate a tool functionally, at the level of knowing which button to press to accomplish an operation, true literacy and fluency with a medium is reflected in a more wholistic appreciation of its effective use in a meaningful context. Consider this interesting comment by a tutor trying to engage students to a collaborative mapping for writing an essay:

"How to make it interesting? How to manage a mindmap? How to make it progress?" - message posted in the LabSpace on the 07/06/2007

The concern here is with the aesthetics of maps to promote engagement, and with the process of managing maps as they evolve. These are more "advanced level" topics, which we are actively researching, and which we will now consider addressing in OpenLearn.

7 Conclusions

We have introduced the rationale for the use Knowledge Cartography tools to support sensemaking around OERs, providing learners and educators with a way to make tangible meaningful connections between ideas and arguments within and across resources. We conceive this as a way to weave explicit narrative coherence, a way to overlay layers of meaning on OERs and indeed, the Web at large, and all the offline resources that learners and educators use (nodes in maps need not refer to digital, online resources).

We described nine kinds of knowledge map, playing the following roles:

Helping learners make sense of OERs:

1. conceptual study map
2. brainstorm map
3. learning path map

Helping educators create, reconstruct and publish learning materials:

4. course module map
5. new OER map
6. hypermedia OER map
7. learning activity map
8. learning design map

Helping OpenLearn collaborators and researchers plan and implement projects:

9. research project map

It is clear that we are not yet seeing widespread sharing of Compendium maps, and that when this does occur, it is by groups who already share a social, intellectual commitment to working with each other. Knowledge maps then become a way to mediate, capture and reflect on their work. Because our OpenLearn surveys tell us that individuals come to OpenLearn primarily for the free OERs, it is not surprising that they do not as a rule share maps — or indeed, engage in a lot of social online activity.

This raises a number of questions that we are now pursuing:

Private use of Compendium. We will be investigating the extent to which individuals are using Compendium privately. The evidence of OpenLearners' blog and forum postings is that at least some of them are finding it useful, but clearly, others downloaded the application, perhaps played a little with it, but took it no further. A web survey with follow-up interviews will soon be conducted.

Compendium usage by existing teams/networks. In parallel, we continue to work with several OpenLearn partner organisations/networks, facilitating the embedding of these and related collaboration tools (Okada et al 2007) into their work practices, and studying their usage patterns.

Web 2.0 to reduce overheads of adoption. The willingness of Web 2.0 users to add FaceBook applications, HTML snippets and other JavaScript widgets to their websites points to a cost-benefit threshold that non-technical users can and do choose to negotiate. A Web 2.0 application which removes the need to install software by delivering maps via directly the Web browser, and makes it possible to embed interactive maps within OERs, may lower the entry threshold, and promote knowledge map creation and sharing. Cohere [cohereweb.net] is a web application released in January 2008 in the main LearningSpace area of OpenLearn. Cohere uses an interface metaphor of “making meaningful connections between ideas”. Those structures might be seeded from uploaded Compendium maps, from tags in social bookmark RSS feeds, existing blog postings, or ideas and connections manually entered by the user. Cohere provides search and visualization tools across multiple maps from multiple authors. It thus provides us with a platform to explore the intersection of the Web 2.0 paradigm and knowledge mapping.

Knowledge mapping for learning design. Our first year's work focused largely on maps for learners. As reported above, in conjunction with Conole (2008), we have begun to consider how OER providers could benefit from visual templates for constructing Learning Design Patterns.

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